Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC

In the Matter of	)	
	)	
Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies	)	ET Docket No. 13-84
	)	
	)	
Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields	)	ET Docket No. 03-137
	)	

COMMENTS OF MOTOROLA SOLUTIONS, INC.

Motorola Solutions, Inc. ("Motorola Solutions") hereby submits these Comments in response to the Federal Communications Commission's ("Commission") Further Notice of Proposed Rulemaking and Notice of Inquiry reviewing the Commission's rules and regulations related to human exposure to radiofrequency emissions from Commission-regulated transmitters and devices.[1]

I. INTRODUCTION AND SUMMARY

Motorola Solutions concurs with the Commission's decision to evaluate its rules and regulations related to RF exposure. As the Commission notes, "[p]eriodic review of the government's rules and regulations to ensure that they have kept pace with current knowledge and changing needs is an important characteristic of good government."[2] The Commission's

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1 *See* Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies, ET Docket No. 13-84, *First Report and Order, Further Notice of Proposed Rulemaking, and Notice of Inquiry,* 28 FCC Rcd 3498 (2013) ("Notice").

2 *Id.*, ¶ 1.

current rules on RF emissions were first adopted in 1996[3] and have not been amended since 1997.[4] There has been a significant amount of study, experimentation, and experience related to RF exposure in that time. This learning has resulted in an international consensus within the scientific community regarding the safety of RF emissions from commonly used communications technologies, and further refinement of the appropriate standards, procedures, and guidelines for measuring and monitoring equipment that emits RF energy.

As the Commission reviews its RF exposure policies, it should begin from the understanding that the current system is working. The Commission's policies have enabled the rapid development and widespread adoption of wireless technologies in the United States in a manner that is safe and sustainable. However, to the extent the Commission seeks to revise these policies, it should strive to harmonize its requirements, procedures, and guidelines with international standards and specifications. A great deal of work has been done in international standards-settings bodies like the Institute of Electrical and Electronics Engineers ("IEEE") and the International Electrotechnical Commission ("IEC"), and the Commission should leverage these efforts in its own policy making. Harmonization with international specifications will help promote innovation and efficiency in the global wireless communications ecosystem while ensuring robust protection for the public.

Basing its oversight role on international standards also will allow the Commission to take advantage of the most up-to-date knowledge on these important issues, enabling it to better keep pace with changes in science, technology, and markets. International scientific

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[3] Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, ET Docket No. 93-62, *Report and Order*, 11 FCC Rcd 15123 (1996).

[4] Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, ET Docket No. 93-62, WT Docket No. 97-192, RM-8577, *Second Memorandum Opinion and Order and Notice of Proposed Rulemaking*, 12 FCC Rcd 13494 (1997).

organizations are continually working to improve and update their specifications and standards consistent with the latest science. These multi-stakeholder processes are data-driven and may offer more efficient means to address some highly complex and technical issues than administrative rulemaking proceedings.

Finally, looking to the future for its RF exposure policymaking, the Commission should recognize that there is no demonstrated need for greater restrictions or increased protections. Instead of adopting new precautionary measures or disclosure obligations, the Commission should emphasize public education and the implementation of international standards.

II. COMMENTS IN RESPONSE TO THE FURTHER NOTICE OF PROPOSED RULEMAKING

In the *Further Notice of Proposed Rulemaking*, the Commission seeks comment on revisions to various aspects of its rules relating to procedures for evaluation of RF emissions and post-evaluation mitigation. Motorola Solutions agrees with the Commission's fundamental premise in the *Further Notice*, that its rules should "appropriately protect the public without imposing an undue burden on industry."[5] The Commission can best meet this goal by incorporating relevant international standards to the greatest extent possible in its policy making. By conforming its requirements and review processes to those endorsed by international standards-setting and scientific organizations, the Commission can ensure sufficient protection to the public while also enabling equipment manufacturers to enjoy the certainty and economies that develop as a result of having a consistent international regulatory regime.

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5 *Notice*, ¶ 108.

A. The Commission Should Streamline its RF Evaluation Exemptions Consistent with International Standards.

Motorola Solutions supports the Commission's efforts to streamline its RF evaluation processes. Adopting evaluation exemptions for cases that obviously present little to no risk is an effective way to conserve time and other resources for both the Commission and industry. The Commission can best achieve this goal by looking to international best practices—as embodied in international standards—and also by ensuring that its exemptions result in a meaningful reduction of the practical burden of conducting evaluations. It is important to stress, as the Commission notes,[6] that these exemptions would only limit the number of routine evaluations conducted; the proposed revisions would not change the substantive RF emission limits enforced by the Commission. Therefore, implementing appropriate exclusions should reduce unnecessary compliance burdens without any increase in risk to the public.

Specifically, Motorola Solutions agrees with the Commission that an evaluation exemption is necessary for certain low-power devices, however the blanket 1 mW exemption proposed by the Commission[7] is too conservative to have a significant impact in terms of streamlining the routine evaluation process. As the Commission notes,[8] under current rules, any transmitter with power of 1.6 mW or lower will be inherently compliant with the Commission's specific absorption rate ("SAR") limit, so conducting routine evaluations on any such devices is unnecessary. While devices transmitting at 1 mW or lower clearly should be exempted from evaluation, requiring review of other low power devices that cannot exceed the SAR limit could raise unnecessary questions about the efficacy of the Commission's established SAR limit. The

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6 *Id.*, ¶ 120.

7 *Id.*, ¶ 125.

8 *Id.*, ¶¶ 122, 124.

Commission's low power exemptions should be more inclusive than only 1 mW or lower transmitters.

Motorola Solutions also supports the Commission's intent to identify additional exemption thresholds based on power, distance, and frequency, as expressed in Tables 1 and 2 of the *Notice*. Because exposure to RF energy is a function of these variables, it is sensible to identify minimum thresholds below which evaluation is unnecessary. Although Motorola Solutions takes no position at this time on the substance of the tables as reflected in the *Notice*, it notes that these tables would be new and unique evaluation exemptions not based on international standards and specifications. Moreover, as the Commission notes, additional factors also are relevant to SAR evaluation, including antenna type and other technology choices,[9] and these factors are not considered by the proposals in the *Notice*.

Rather than adopting a 1 mW exemption or new and unique SAR- and maximum permissible exposure ("MPE")-based tables, which would require special procedures and practices be developed for the U.S. market that are inconsistent with those implemented internationally, the Commission should instead look to established, widely-adopted international standards for its RF evaluation practices. Specifically, Motorola Solutions recommends that the Commission review and incorporate into its rules the International Electrotechnical Commission assessment standards expressed in IEC 62479 (2010).[10] IEC 62479 (2010) contains two tables that are intended to accomplish exactly what the Commission sets out to do in the *Notice*: identify those low power scenarios in which SAR limits cannot possibly be exceeded, and which

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9 *Id.*, ¶ 150.

10 IEC 62479, Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz), IEC Central Office, Geneva, Switzerland, 2010.

therefore should be exempt from further routine evaluation. Table A.1, "Example values of SAR-based P_{max} for some cases described by ICNIRP, IEEE C95.1-1999 and IEEE C95.1-2005," identifies such obvious exclusions both where all power is being absorbed by 1 gram of mass, as in the older IEEE C95.1-1991 standard (on which the Commission's current rules are based), or by 10 grams of mass, as in the currently in-effect IEEE C95.1-2005. Table B.1, "Some typical frequency bands of portable wireless devices and corresponding low-power exclusion levels P_{max} predicted using Equations (B.1) through (B.9)," shows other obvious exclusions based on various antenna, frequency, technology, and separation combinations at even higher powers than Table A.1.

One of the concerns identified by the Commission as informing its selection of the 1 mW exemption was the "worst-case" scenario of medical implants,[11] however, here as well international standards provide a useful model. Both IEEE C95.1-1991 and IEEE C95.1-2005 did not subject medical devices to the general population peak exposure limits, and the Commission should not do so either. Medical devices are implanted under the close supervision of medical professionals after a thorough consideration of all risks and benefits. Decisions made in the clinical setting on an individual basis for devices not available to the general public should not be subject to SAR limits and evaluation procedures designed with general public exposure in mind. Instead, the Commission should look to the example of international scientific organizations that have treated such devices differently, such as IEC 60601-2-33.[12]

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11 *Notice*, ¶ 125.

12 IEC Standard 60601-2-33. "Medical electrical equipment – Part 2-33: Particular requirements for the basic safety and essential performance of magnetic resonance equipment for medical diagnosis," International Electrotechnical Commission, Geneva, Switzerland, March 2010.

Adopting international standards will allow the Commission to leverage years of collaborative study and progress by the foremost experts in these areas from around the world, simultaneously creating efficiencies for the Commission and industry, while also ensuring the public is protected consistent with the most up-to-date scientific knowledge. However, if the Commission decides to adopt divergent methodologies, as proposed, it must ensure that the formulae, tables, and procedures it implements are practical, accurate, and effective. The Commission should also take care that its procedures are, to the extent possible, free from ambiguity that could complicate or create controversy in compliance. For example, in applying its proposed ambient exposure quotient ("AEQ") formula for multiple-transmitter devices,[13] the Commission should be clear that a single transmitting device should only contribute to one of the three parts of the equation, so as to prevent triple counting.

B. A Revised KDB Process Could Be an Acceptable Replacement for OET Bulletins in Some Circumstances.

Motorola Solutions supports the Commission's move toward referencing the OET Knowledge Database ("KDB") for some procedural and evaluative guidelines rather than referencing OET Bulletins or other specific technical resources in its rules.[14] In some instances, referencing the KDB will enable the Commission's procedural recommendations better to keep pace with developments elsewhere in the scientific and technical community. For example,

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13 *See Notice*, ¶ 164.

14 *See id.*, ¶ 28.

eliminating reference to IEEE C95.3-1991, as proposed in the Notice,[15] is appropriate because that guideline is outdated and has been replaced by C95.3-2002.[16]

Substituting references in the Commission's rules to specific standards with the KDB does, however, have the potential to compromise the Commission's notice and comment rulemaking procedures—rooted in the fundamental right of due process—and therefore the Commission should consider some improvements to the process. Specifically, the KDB process, while being faster than rulemaking, has neither the same consensus procedures of a standard-setting body nor the checks and safeguards of the rulemaking process. Therefore, to the extent the Commission chooses to continue down this path, it should engage manufacturers and other affected entities early in the development phase of KDB revisions and solicit their input on proposed revisions and updates. Motorola Solutions notes that the Office of Engineering and Technology has begun taking steps in this direction already, and encourages the Commission to endorse further such reforms. By providing ample opportunity to review, respond to, and contribute in the KDB development process in advance, the Commission can ensure that the KDB becomes an expert-driven process that is responsive to changes in technology and standards.

C. The Commission Should Base its Mitigation Procedures on International Standards.

As with its evaluation exemptions, the Commission can best serve the public interest and minimize burdens by conforming its mitigation procedures to international standards. Motorola Solutions applauds the Commission for looking to specifications such as IEEE standards C95.7-

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15 *Id.*, ¶ 174.

16 *See* IEEE Standard C95.3-2002, "IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to such Fields, 100 kHz-300 GHz."

2005 and C95.2-1999 in developing its proximity restriction and disclosure requirements for fixed RF sources.[17] The Commission should look to such standards as the basis for the whole range of its RF exposure compliance regime. In particular, as C95.7-2005 is intended to complement C95.1-2005, the Commission also should look to that specification for its substantive RF rules.

The Commission should also look to international standards for its treatment of transient exposure in controlled environments. Motorola Solutions supports the Commission's efforts to bring additional clarity and precision to its rules for transient exposure,[18] however it is important that the rules be both effective and practical. As such, the Commission should not adopt its proposal "to require supervision of transient individuals by trained occupational personnel within the controlled area where the general population limit is exceeded."[19] Requiring specially-trained personnel for this purpose would be unnecessarily costly and burdensome, especially for remote areas where exposure to transient persons is rare or typically very brief. Additionally, the Commission's time-averaging proposals, while intended to provide flexibility in controlled environments, may be difficult to monitor or implement on a day-to-day basis. Instead, the Commission should look to the IEEE C95.7-2005 RF safety program, which relies on appropriate signage and instructions for transient persons, allowing them to pass quickly through an area subject to the occupational/controlled exposure limits.

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17 *Notice*, ¶ 185.

18 *Id.*, ¶¶ 177-183.

19 *Id.*, ¶ 182.

III. COMMENTS ON THE NOTICE OF INQUIRY

In the *Notice of Inquiry*, the Commission, recognizing the great deal of completed and ongoing scientific research in the area, and the significant time that has passed since it adopted its current rules, seeks to open a "science-based examination of the efficacy, currency, and adequacy of the Commission's exposure limits for RF electromagnetic fields."[20] Motorola Solutions appreciates the Commission's emphasis on science and its attention to the work done by international scientific and standards organizations in this area. As it moves forward in this proceeding, the Commission should continue to be guided by these expert resources, and it should seek to harmonize its rules and regulations with internationally-recognized standards, to the greatest extent possible.

A. RF Exposure Limits Should Be Based on International Standards.

For its reexamination of the RF exposure rules, the Commission should begin from the understanding that the current limits have been working. The regime in place since 1996 has facilitated the rapid expansion and development of wireless technology in a manner that experience has demonstrated is fundamentally safe. However, it is appropriate for the Commission to consider revision to its regulatory regime at this time to account for revisions to the underlying technical standards and new developments in international best practices.

The Commission should conform its RF exposure limits and evaluation regimes with international standards to the greatest extent possible. Specifically, the Commission should adopt the limits, practices, and procedures contained with IEEE standard C95.1-2005, and related specifications, which represent the most up-to-date scientific learning in this area, and form the basis for most other international RF exposure regulatory regimes. Moreover, C95.1-2005 was

[20] *Id.*, ¶ 210.

developed in a multi-stakeholder approach, with the active participation of the Commission, the Food and Drug Administration ("FDA"), the Occupational Safety and Health Administration ("OSHA"), and the Center for Disease Control's ("CDC") National Institute for Occupational Safety and Health ("NIOSH") ensuring that the public interest of the American people was fully represented. Because C95.1-2005 is the latest version of the C95.1-1991 standard on which the current Commission rules are based, updating the rules to reference the new standard would be a logical modernization and continuation of the Commission's heretofore successful RF policies.

In particular, the Commission should adopt the SAR limits of 2.0 W/kg averaged over 10 grams of tissue for localized exposure of the general public and 10 W/kg averaged over 10 grams of tissue for occupational exposure, which are endorsed both by IEEE C95.1-2005 standard and the ICNIRP guidelines. These standards have been reaffirmed as safe repeatedly in published studies, and have replaced wholly the 1.6 W/kg and 8 W/kg (both averaged over 1 gram of tissue) limits from the 1991 version of C95.1. Indeed, no currently-effective international standard or guideline continues to support the Commission's current SAR limits.

Both IEEE and ICNIRP average exposure across 10 grams of tissue. This is because the only established health effect related to exposure in the RF range are thermal effects, and computations have demonstrated that averaging across 10 grams correlates better with temperature rise than 1 gram averaging. As the Commission notes, there is a difference between IEEE C95.1-2005 and the ICNIRP guidelines with respect to modeling the 10 grams of tissue.[21] The IEEE standard is based on a 10 gram cube of tissue, whereas the ICNIRP guideline theoretically considers any 10 grams of contiguous tissues. However, because of the need for a unified method of assessment, all international measurement and computational methods use the

[21] *Id.*, ¶ 220.

10 gram cube.[22] There is no standardized assessment based upon contiguous tissue. The Commission should adopt the more practical IEEE approach of using a 10 gram cube.

IEEE C95.1-2005 contains the most current, research-based findings on various other aspects addressed in the *Notice*, and the Commission should update its regulatory regime accordingly. Specifically, the Commission should adopt the limits and procedures contained within C95.1-2005 with respect to spatial averaging and maximum power density, time averaging periods, and treatment of peak pulsed RF fields.[23] In each case, the IEEE standard is based on better thermal modeling and the prevention of established adverse effects.

The Commission's evaluation guidelines should also reflect international standardization work. As the Commission notes, "[e]valuation is a rapidly evolving area, keeping pace with technological changes, that is most effectively guided by good engineering practice rather than specific regulations."[24] There are strengths and weaknesses to using measurement or computation as a mechanism for RF evaluation.[25] Measurement methods are well established and the related international standards provide reliable results with well-defined uncertainty. However, measurement methods may lack the flexibility to model different exposure conditions that might be required for some products and the measurement process itself can be slow. Computational techniques, which are being standardized by both IEC and IEEE, are more flexible and increasingly reliable. Ultimately, the Commission should enable the use of international standards for evaluation by measurement or computation where reliable and appropriate. This would be the most effective way to take advantage of the peer-reviewed,

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22 *See, e.g.*, IEEE 1528-2003; IEC 62209-1 (2005); IEC 62202-2 (2010).

23 *See Notice*, ¶¶ 221-224.

24 *Id.*, ¶ 244.

25 *Id.*, ¶ 245.

internationally accepted methodologies for SAR evaluation. Specifically, as the Commission considers evaluation mechanisms for fixed stations,[26] it should adopt the IEC 62232-2011 base station standard.[27]

In addition to leveraging the best, most up-to-date science, policy-making based on international standards and practices would offer other benefits for the industry and the public. International harmonization of regulatory regimes would allow device manufacturers to take advantage of new economies of scale and shortened product development cycles for equipment that can be marketed globally, as opposed to making separate versions of devices for the important U.S. market and for the rest of the world. Manufacturers' compliance burdens would also be reduced due to being able to use the same evaluation processes around the world. All of this would benefit consumers, who would enjoy lower prices on devices and increased availability of a diverse range of products. Smaller manufacturers and consumers in historically underserved markets would benefit most from these advantages. These benefits would be equally impactful in the enterprise and public safety sectors, as well.

B. The Commission Should Emphasize Public Education Regarding RF Safety.

In the *Notice*, the Commission seeks comment on strategies for providing information to consumers regarding RF safety.[28] The Commission also seeks comment on whether lower RF exposure limits or other additional precautionary measures would be appropriate.[29] Motorola Solutions believes that no additional federal mechanisms are needed for providing information to

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[26] *Id.*, ¶ 246.

[27] IEC Standard 62232,"Determination of RF field strength and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure" Geneva, Switzerland, 2011.

[28] *Notice*, ¶¶ 231-235.

[29] *Id.*, ¶¶ 236-243.

consumers regarding specific devices. Rather than providing duplicative federal databases or exploring new precautionary measures—both of which could confuse consumers and raise unwarranted concern—the Commission should emphasize public education about proper usage of wireless communications.

There is no lack of publicly available information regarding RF exposure, SAR limits, and the performance of specific devices. The Commission already provides extensive, user friendly information about SAR generally, as well as a comprehensive database with SAR information about a wide range of consumer, enterprise, and public safety devices.[30] Additional information is provided by various other governmental entities including the FDA and the World Health Organization. Moreover, as the Commission notes, private entities have made SAR information available to consumers.[31] Finally, industry groups have taken different approaches to making SAR and other RF safety information available.[32] For example, Motorola Solutions provides on its website information about the relevant technical standards, an overview of research on the topic, and answers to frequently asked questions related to wireless safety and health.[33] Motorola Solutions also contributes complete data to the Commission's public

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30 *See, e.g.*, "FCC Encyclopedia: Radio Frequency Safety," http://www.fcc.gov/encyclopedia/radio-frequency-safety; "FCC Encyclopedia: Specific Absorption Rate for Cellular Telephones," http://www.fcc.gov/encyclopedia/specific-absorption-rate-sar-cellular-telephones; "Specific Absorption Rate (SAR) for Cell Phones: What it Means for You," http://www.fcc.gov/guides/specific-absorption-rate-sar-cell-phones-what-it-means-you.

31 *See, e,g.*, CNET Review, "Cell phone radiation levels" http://reviews.cnet.com/cell-phone-radiation-levels.

32 *See, e.g.*, CTIA—The Wireless Association, "Wireless Phones and Health," http://www.ctia.org/consumer_info/safety/index.cfm/AID/10371; Mobile Manufacturers Forum, "SARTick.com," http://www.sartick.com/.

33 Motorola Solutions, Inc., "RF Exposure and Assessment Standards" http://responsibility.motorolasolutions.com/index.php/downloads/dow07-

databases and includes information about proper use of devices and approved accessories with every device.

The Commission should not adopt new disclosure requirements that would provide no new useful information to consumers. The Commission also should not revise its online databases to link SAR information to device model numbers. The FCC ID is a unique identifier and should be preserved as the primary resource identifier in the Commission's databases. Model numbers are inherently less precise and could cause confusion. Model numbers are not used consistently among manufacturers, and in some cases devices with different FCC IDs could be marketed under the same model number or trade name. In light of the range of additional information already available, there is simply no need for a Federal disclosure mandate or a new/revised Commission database.

Similarly, the Commission need not explore new precautionary mechanisms. As the Commission notes, its current limits are intended to set exposure a level 50 times lower than exposure levels at which adverse effects have been observed.[34] Additionally, the World Health Organization, FDA, National Cancer Institute, and various other institutions with the primary mission of protecting the public health have unanimously found no increased health risks associated with wireless device usage. Any new precautionary measures adopted by the Commission could undermine the clear and valid conclusion about the fundamental safety of wireless communications while simultaneously provoking unjustified concerns. Instead, any

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rfexposureassessmentstand/; Motorola Solutions, Inc., "Research" http://responsibility.motorolasolutions.com/index.php/downloads/dow08-researchrfenergy/; Motorola Solutions, Inc., "FAQ about wireless communication and health" http://responsibility.motorolasolutions.com/index.php/downloads/faq/.

[34] *Notice*, ¶ 236.

public education efforts by the Commission should reinforce this message. As discussed above, rather than adopting new precautionary measures, the Commission should consider adopting the international SAR limits that are implemented by the majority of countries around the world.

C. The Commission Should Not Require Consideration of "Zero" Separation for Body-Worn Testing.

Accurate SAR evaluation should, to the greatest extent possible, emulate real-world usage of the devices as designed and recommended by the manufacturers. As such, testing of body-worn use should be conducted using normal accessories as advised by the manufacturer and subject to the separation distances produced by those accessories. As the Commission notes, manufacturers have long been encouraged to include information in manuals making consumers aware of appropriate usage of devices in body-worn configurations.[35] For example, manufacturers participating in the Mobile Manufacturers Forum SAR Tick program use standardized language advising consumers to use approved accessories or otherwise maintain a specified body separation during body-worn use.[36] Motorola Solutions provides such accessories as well as detailed recommendations about appropriate device usage. Testing should continue to follow these recommendations and the Commission should not begin requiring additional testing for speculative use cases that are inconsistent with manufacturer recommendations. Specifically, manufacturers that address product compliance proactively by providing users with suitable accessories and explain proper usage should be permitted to test according to these specifications.

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35 *Id.*, ¶ 248.

36 *See* "What is the SAR Tick?" http://sartick.com/sar-tick.cfm.

IV. CONCLUSION

Motorola Solutions appreciates this opportunity to participate in the Commission's review of its RF exposure regulatory regime. The Commission is correct to review its RF safety rules at this time, in light of the significant amounts of research and learning that have been completed since the current rules were last revised in 1997. As it proceeds with this reevaluation, the Commission should strive to harmonize its requirements, procedures, and guidelines with international standards and specifications.

Respectfully submitted,

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